not become excessive and cause potential toxicity problems. It is our conclusion that ionized copper, as a tool to treat irrigation water is a viable and effective means of water treatment. Our system has been installed for 2 years and we feel we have enough confidence to expand beyond the one area we are treating now. It is safer to the surrounding environment with virtually no health risk compared to chlorine. The overall system is simple to run and is virtually maintenance free. It may or may not be right for everyone but it could play a role in the treatment of irrigation water under the right conditions.

LITERATURE CITED

Ledford, D. 2001. No excess copper. NMpro, September.

Growth of Herbaceous and Woody Perennials in Spent Mushroom Substrate Composted by Aerated and Static Methods©

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INTRODUCTION

Spent mushroom substrate (SMS) is defined as the material that remains after a mushroom production cycle. The substrate for the bulk of commercially produced mushrooms (*Agaricus bisporus*) is generally composed of horse and chicken manure, hay and wheat straw, as well as supplements such as cottonseed meal, husks and hulls, corn cobs, limestone chips, gypsum, urea, and minerals that is first composted then used for mushroom production. Large quantities of SMS are being produced every year and in concentrated areas, so its disposal poses an issue. One of the major problems with storing or holding SMS is that it continues to compost and goes anaerobic producing of an offensive odor. Other problems include nutrient leaching from the SMS into the ground water and unsightly appearance when piled on farmland. Currently the SMS that is used by the nursery and greenhouse industry is aged 1 or more years. To reduce the time and space needed to store SMS, Young, 2000 demonstrated that fresh SMS could with special handling be used for greenhouse and nursery crops with out aging. If fresh SMS is not used immediately but has to be stored, the pile of SMS will go anaerobic and the odor will be offensive to the surrounding community. To over come this problem we are evaluating if a 30-days aerobic composting period will create a fairly stable type of SMS that then can be used by the nursery and greenhouse industry. The objective of this research was to determine the response of plant species to aerated and static SMS and five mix concentrations.

MATERIAL AND METHODS

For potting the herbaceous perennials, the aerated and the static pile SMS were mixed with the MetroMix 360 (MM 360) in five different ratios (0%, 25%, 50%, 75%, and 100%). In the same way for the woody perennials, the aerated and static SMS were also mixed with the Hanson's nursery mix (HNM) in the same ratios. Each treatment was replicated 10 times. The pots were leached thoroughly over a 2-day period to remove the excess soluble salts. After the soluble salt load was reduced, the pots were arranged in the greenhouse in a completely randomized design. The plants were watered by the automated fertigation system installed in the greenhouses, and were fertilized with Peter's 21-7-7 ($N\text{-}P_2O_5\text{-}K_2O$) acid special fertilizer at 250 ppm N, on a daily basis. Greenhouse temperatures were maintained at approximately 70°F day temperature and 60°F night temperatures throughout the growth cycle of the crop.

RESULTS

***Hosta* 'Green and Gold'.** Although the fresh and dry weights did show some differences over the different mix types, it should be noted that in commercial greenhouse production, the most important attributes are appearance, plant size, flowering characteristics, and quality. The recommended mix proportions for *Hosta* based on this experiment, would be 25% to 50% mixes of either aerated or static composted SMS.

Figure 1. *Hosta* 'Green and Gold' growing in spent mushroom substrate (SMS) mixed with with MetroMix 360. Left to right: SMS 0%, 25%, 50%, 75%, and 100%.

***Thuja occidentalis* 'Pyramidalis'.** Plant fresh and dry weights were not affected by aerated or static SMS or by the percent SMS in the mix. The recommended mix proportions for *Thuja* based on this experiment, would be all mix volumes from 25% through 75% SMS.

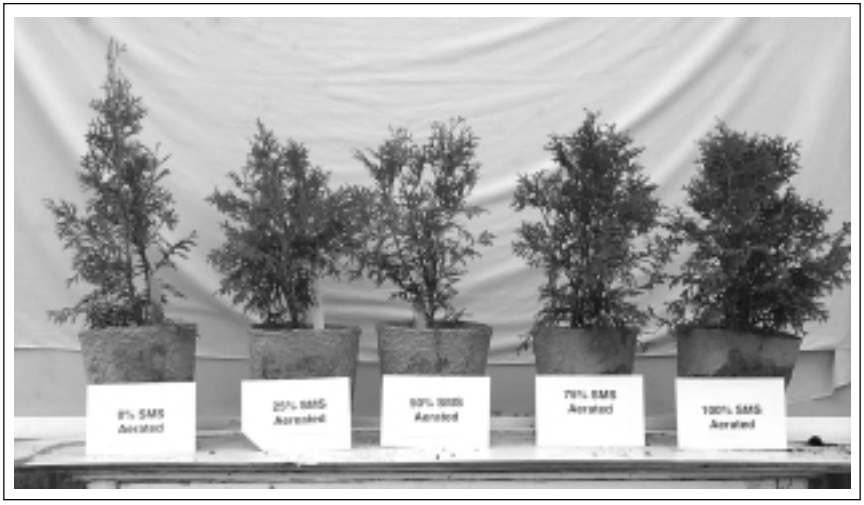

Figure 2. Thuja occidentalis 'Pyramidalis' growing in spent mushroom substrate (SMS) mixed with with MetroMix 360. Left to right: SMS 0%, 25%, 50%, 75%, and 100%.

CONCLUSIONS

It can be concluded that for commercial production SMS can be a satisfactory medium. As long as the initial treatment of rapid leaching is carried out carefully and proper management practices like monitoring salt levels during the growth phase are conducted, SMS can be a good alternative to other commercial mixes in regards to the response of plant species to aerated and static SMS, composted SMS appears to be similar. Additional work is need to study an expanded list of plant taxa in static and aerated SMS.